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Primordial features and Planck polarization

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Abstract

© 2016 IOP Publishing Ltd and Sissa Medialab srl .With the Planck 2015 Cosmic Microwave Background (CMB) temperature and polarization data, we search for possible features in the primordial power spectrum (PPS). We revisit the Wiggly Whipped Inflation (WWI) framework and demonstrate how generation of some particular primordial features can improve the fit to Planck data. WWI potential allows the scalar field to transit from a steeper potential to a nearly flat potential through a discontinuity either in potential or in its derivatives. WWI offers the inflaton potential parametrizations that generate a wide variety of features in the primordial power spectra incorporating most of the localized and non-local inflationary features that are obtained upon reconstruction from temperature and polarization angular power spectrum. At the same time, in a single framework it allows us to have a background parameter estimation with a nearly free-form primordial spectrum. Using Planck 2015 data, we constrain the primordial features in the context of Wiggly Whipped Inflation and present the features that are supported both by temperature and polarization. WWI model provides more than 13 improvement in χ2 fit to the data with respect to the best fit power law model considering combined temperature and polarization data from Planck and B-mode polarization data from BICEP and Planck dust map. We use 2-4 extra parameters in the WWI model compared to the featureless strict slow roll inflaton potential. We find that the differences between the temperature and polarization data in constraining background cosmological parameters such as baryon density, cold dark matter density are reduced to a good extent if we use primordial power spectra from WWI. We also discuss the extent of bispectra obtained from the best potentials in arbitrary triangular configurations using the BI-spectra and Non-Gaussianity Operator (BINGO).

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Keywords

cosmological parameters from CMBR, cosmological perturbation theory, ination, non-gaussianity